PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in the Manufacture of Articles of Refined Glass

We, WIENER RADIOWERKE AKTIENGESELLSCHAFT, of 1, Abbegasse, Vienna, XIV, Austria, an Austrian company, do hereby declare the nature of this invention and in what manner the same is to be performed, to be fully described and ascertained in and by the following statement:—

Articles made of glass, for instance hollow glassware, table glass and the like, if no special precautions are taken for refining, are liable to exhibit defects such as entrapped bubbles or gas (air-bells), and also smearing, owing to lack of homogeneity.

In order to obviate or minimise such defects it is known to add to the mixture substances which in the melt evolve gases, or to inject gases or vapours through nozzles, in order to carry off the air-bells by means of the ascending bubbles of gas, and to eliminate streakiness by stirring. As refining additions, oxidising agents such as saltpetre have been recommended, or even gaseous oxygen, since by this means, in addition to the mechanical refining, a chemical decolouration of the glass is obtained, by converting the iron from the ferrous to the ferric form.

Sometimes, though less frequently, the problem is encountered of subjecting the melt to a reducing treatment, for instance when it is a question of manufacturing coloured glass.

The means hitherto known for injecting gases or liquids into the glass melt consist of graphite tubes, which however are very liable to catch fire at high temperatures when in contact with oxygen, and which furthermore impart a brownish tinge to the melt; or of perforated firebrick slabs, inserted as in the glass tank bottom plates, gases such as oxygen being blown into the melt through the perforations. This latter arrangement however has the disadvantage that according to the temperature prevailing at the perforations in the tank bottom either the outlet apertures become choked with viscous glass, or the fireclay is attacked, whereby fresh impurities are introduced into the melt. Furthermore trumpet-shaped nozzle apertures are formed, partly in consequence of the molten glass attacking the fireclay, and partly owing to the discharging into the viscous bottom layer of the melt, whereby the result arises that the injected gases or vapours are released in the form of large bubbles, which are not adapted to carry off the tiny air-bells and to homogenise the melt.

According to the invention these disadvantages are obviated by employing, as the supply means to the nozzle through which the gases or liquids serving for the refining are injected, a metal tube which is cooled by flowing water.

The method according to the invention may be employed either for the mechanical mixing of the molten material or for the oxidation (or reduction), but it is particularly advantageous to employ it for both purposes at the same time.

If water is injected into the molten material through the nozzle according to the invention, a thorough mixing occurs without any chemical change. The water issuing from the nozzle is suddenly vaporised upon contact with the highly heated glass melt and form bubbles of steam, which rise to the surface of the glass, and in so doing exert an energetic stirring action, and also carry away with them relatively small bubbles of gas (air-bells). If however compressed air, or, better still, compressed oxygen, issues from the nozzle into the glass melt, a powerful oxidation occurs, in a manner known in itself, in addition to the mechanical mixing, whereby a chemical decolouration is effected. A similar result is obtained by injecting an aqueous solution of hydrogen peroxide. It is also possible, however with a view to distributing the oxidising action over a longer interval of time, to inject the aqueous solution of a solid oxidising agent, for instance a solution of saltpetre, so as to combine a transitory stirring action with a slowly acting oxidation. By taking samples of the glass melt for testing from time to time it can be ascertained whether the refining or oxidation has advanced far enough, so as to avoid waste of oxidising agents. In the same way also reducing agents may be injected, particularly organic substances.

The invention is illustrated by way of ex-

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ample in the accompanying drawings, in which:

Figure 1 shows one form of construction of an injection tube, partly in section;

Figures 2 and 3 show another form in front and side elevation respectively; and

Figure 4 is a perspective view of a melting tank, with the arch partly cut away.

In figure 1, the metal tube 2, the lower part of which is shown in section, contains an inlet tube 1 for the cooling medium, water for example, and a metallic supply tube 3, which delivers fluid to the nozzle 4 for injection into the melt. The cooling medium flows back in the space between the inner tubes 1 and 3 and the outer tube 2. The nozzle 4 may consist only of the outlet aperture of the metallic supply tube 3, and in this case should not project far out of the cooling tube 2, in order that it may not be unduly heated by the molten glass. Alternatively, as represented in the drawing, the nozzle body of heat-resistant material, such as heat-resisting steel for example, inserted into the end of the supply tube 3. In the latter case the nozzle 4 may project so far that the nozzle opening assumes when in operation a medium temperature which is nearer to that of the molten glass than to that of the cooled supply pipe. This has the advantage that the nozzle aperture cannot become choked with solidified glass, so that even intermittent injections are possible. In the absence of such a nozzle, on the other hand the injection must be effected uninterruptedly so long as the tube 1 is immersed in the glass melt. A somewhat projecting nozzle of heat-resisting material yields the important advantage that the bubbles of gas remain small and readily become detached, whereby the purifying action is materially improved.

A further form of construction is illustrated in Figures 2 and 3, in which the nozzle 4 is directed obliquely upwards, in order to facilitate still more the release of the bubbles of gas. The inlet tube for the cooling medium, which is again denoted by 1, forms a loop with the outlet tube 2. The supply tube 3 leading to the nozzle 4 may be lodged in the interior either of the inlet tube 1, or, as here shown, of the outlet tube 2.

When the water-cooled metal tube that protects the nozzles and their supply tube is dipped into the glass melt, it surrounds itself with a layer of solidified glass, and is therefore not itself attacked by the molten glass.

A hollow arm enclosing the nozzle supply tubes and the cooling medium tubes may furthermore be movably arranged, in order to enable a tank to be successfully treated with one nozzle instead of a plurality of nozzles, so that the refining or oxidising or reducing agent, instead of always acting at one and the same part of the tank, can be moved about to all parts of the molten mass in turn.

Figure 4 shows a melting tank 5 with the arch in section. The stirring appliance projects into the glass melt with a loop of tube. Here the point of withdrawal of glass from the tank is assumed to be in the foreground, so that the molten glass flows from back to front. The inlet and outlet tubes for the cooling medium are in a line with one another, and enable the nozzle to be moved in a direction at right angles to the direction of flow of the glass. Moreover they form an axis about which a swinging movement can take place. The supply tube 3 is here arranged inside the inlet tube 1.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A method of manufacturing articles of refined glass, wherein gaseous or liquid substances are injected into the glass melt through nozzles, characterised by the feature that as the supply pipe to the nozzle or nozzles a water-cooled metal tube is employed.

2. A method of manufacturing articles of refined glass as claimed in Claim 1, characterised by the feature that the nozzle itself is less cooled than the supply pipe, and that the nozzle consists of heat-resisting metal or alloy, preferably of heat-resisting steel.

3. A method of manufacturing articles of refined glass as claimed in Claim 1 or 2, characterised by the feature that an arm enclosing the nozzle supply pipe and the cooling medium inlet is movably constructed.

4. A method of manufacturing articles of refined glass as claimed in Claim 3, characterised by the feature that the nozzle is so arranged that it can be moved across the tank in a direction at right angles to the direction of flow of the glass.

5. A method of manufacturing articles of refined glass as claimed in Claim 3 or 4, characterised by the feature that the nozzle can be rocked in the direction of flow of the glass.

6. A method of manufacturing articles of refined glass as claimed in any one of the preceding claims, characterised by the feature that through the cooled nozzle an aqueous solution of hydrogen peroxide or of solid oxidising agents is injected.

7. A method of manufacturing articles of refined glass as claimed in any one of the Claims 1 to 5, characterised by the feature that through the cooled nozzle an organic reducing agent is injected.

8. A method of or means for manufac-

turing articles of refined glass, substantially as hereinbefore described with reference to the accompanying drawings.

9. Articles of refined glass manufactured by the method or by the use of the means claimed in any of the preceding claims.

Dated this 27th day of May, 1949.

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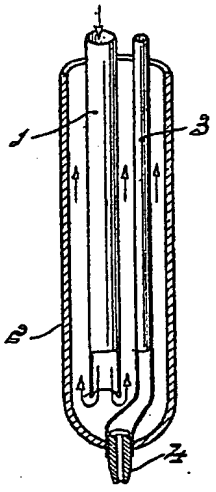

Fig. 1

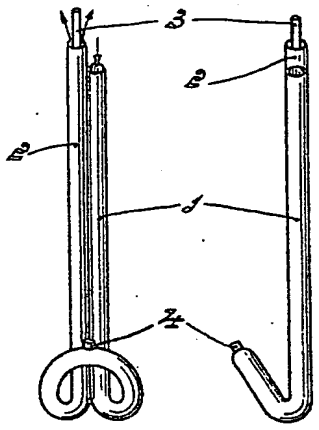

Fig. 2

Fig. 3

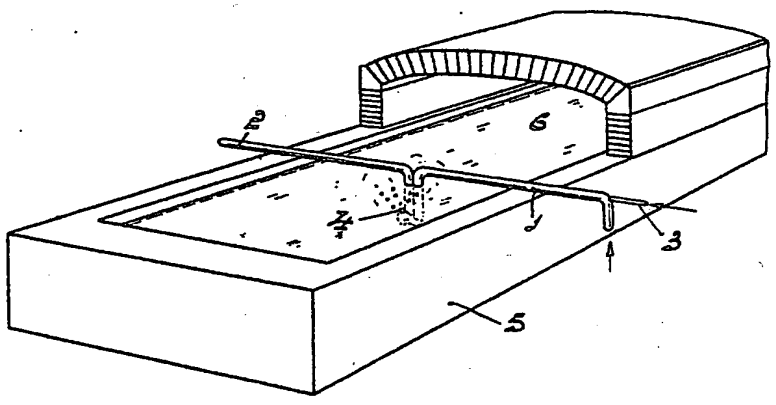

Fig. 4

H.M.S.O. (M.F.P.)